

Sorption of ionic liquids onto carbon nanotubes

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For 20 years, many scientific publications have reported the presence of new compounds in the environment – emerging pollutants (EPs). However the largest challenge in the management of EPs is identification of the chemical substances which potentially can become dangerous in the future and minimisation of the potential threat they might pose. Therefore, in spite of the mentioned group of contaminants, another important class of pollutants can be distinguished – potential pollutants (PPs), whose occurrence in the environment has not been documented yet but such probability is high nevertheless. Due to their unique properties (e.g. thermal stability, insignificantly negligible volatility, non-flammability, miscibility with water or other solvents) ionic liquids are videly used in in a variety of industrial processes nowadays. Thus a danger of possible contamination of the environment by these compounds is highly probable, and hence they can be considered as PPs.

The lack of fresh and clean water is a ubiquitous problem around the world. Water demand is growing rapidly as a result of increasing population and rapid urbanization. Therefore there is an urgent need to design new, cost effective and efficient technologies for complete removal of pollutants from wastewaters. Many advanced technologies have been established, however, most of these processes are not "eco-friendly" and cannot be made sustainable until a number of issues. Therefore alternative solutions need to be developed. One of the most effective method in wastewater treatment is adsorption because processes based on this concept are simple, highly efficient and easy to operate. This technology can handle fairly large flow rates, producing a high quality effluent that does not result in formation of harmful substances such as e.g. ozon and free radicals. Although activated carbon (AC) is one of the most widely used adsorbents in water treatment, its application in water treatment also suffers from several bottlenecks, such as slow adsorption kinetics and difficulty for regeneration. Therefore, identifying alternative materials to AC is a key issue for tertiary treatments to remove xenobiotics from WWTP effluent and further research is required with respect to the design and preparation of novel absorbents with good sorption and regeneration properties.

The aim of this work was study on the applicability of different carbon nanotubes (CNTs) as potentials adsorbents for the effective removal of selected PPs from wastewater following the parameters variation (e.g. pH and ionic strength) influencing the studied process. The strength and extent of the sorption phenomena were determined by sorption isotherms and sorption coefficients. All the results were modelled by Freundlich and Langmuir isotherms. Obtained results show that CNTs can be considered as superior to ACs in terms of sorption kinetics. Moreover sorption of ILs on CNTs is highly effective process.